

What is claimed is:

1. A plasma CVD apparatus comprising:
 - first and second electrodes;
 - neutral gas introduction pipes; and
 - a plasma confining electrode interposed
- 5 between said first and second electrodes to separate a plasma generation region and a substrate processing region,
 - wherein said plasma confining electrode has a hollow structure defined by an upper electrode plate, and a lower electrode plate, and has gas diffusing plates provided in the hollow structure, and has radical passage holes provided to supply radicals from said plasma generation region into said substrate processing region while isolating from a neutral gas,
- 10 said plasma confining electrode is connected to said neutral gas introduction pipes, and a plurality of neutral gas passage holes are provided for each of said lower electrode plate and said gas diffusing plates to supply said neutral gas into said substrate processing region, and
- 15 a total opening area of said plurality of neutral gas passage holes in said gas diffusing plate on a side of said upper electrode plate is smaller than that of said plurality of neutral gas passage holes in said gas diffusing plate on a side of said lower electrode plate.
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- 25

2. The plasma CVD apparatus according to claim 1, wherein the number of said neutral gas passage holes in said gas diffusing plate on the side of said lower electrode plate is more than the number of said 5 neutral gas passage holes in said gas diffusing plate on the side of said upper electrode plate.

3. The plasma CVD apparatus according to claim 1, wherein first ones of said plurality of neutral gas passage holes in each of said gas diffusing plates are different in diameter from second ones of said 5 plurality of neutral gas passage holes in each of said gas diffusing plates.

4. The plasma CVD apparatus according to claim 1, wherein positions of said neutral gas passage holes in said gas diffusing plate nearer to said lower electrode plate are different from positions of said 5 neutral gas passage holes in said gas diffusing plate nearer to said upper electrode plate.

5. The plasma CVD apparatus according to claim 4 wherein a region of said neutral gas passage holes in said gas diffusing plate nearer to said lower electrode plate is arranged in an outside region of a 5 region of said neutral gas passage holes in said gas diffusing plate nearer to said upper electrode plate.

6. The plasma CVD apparatus according to claim 1,
wherein said gas introduction pipes extend from a
lateral direction of said plasma confining electrode
to be coupled to side portions of said plasma
5 confining electrode.

7. The plasma CVD apparatus according to claim 1,
wherein said gas introduction pipes extend to pass
through a peripheral portion of said plasma generation
region to be coupled to upper portions of said plasma
5 confining electrode.

8. A plasma CVD apparatus comprising:
first and second electrodes;
neutral gas introduction pipes; and
a plasma confining electrode interposed
5 between said first and second electrodes to separate a
plasma generation region and a substrate processing
region,
wherein said plasma confining electrode has a
hollow structure defined by an upper electrode plate,
10 and a lower electrode plate, and has gas diffusing
plates provided in the hollow structure, and has
radical passage holes provided to supply radicals from
said plasma generation region into said substrate
processing region while isolating from a neutral gas,
15 said plasma confining electrode is connected

to said neutral gas introduction pipes, and a plurality of neutral gas passage holes are provided for each of said lower electrode plate and said gas diffusing plates to supply said neutral gas into said 20 substrate processing region, and

25 a distribution density of opening area consisting of said plurality of neutral gas passage holes is higher in a central portion of each of said gas diffusing plates than in a peripheral portion thereof.

9. The plasma CVD apparatus according to claim 8, wherein the number of said neutral gas passage holes in said gas diffusing plate on the side of said lower electrode plate is more than the number of said 5 neutral gas passage holes in said gas diffusing plate on the side of said upper electrode plate.

10. The plasma CVD apparatus according to claim 8, wherein first ones of said plurality of neutral gas passage holes in each of said gas diffusing plates are different in diameter from second ones of said 5 plurality of neutral gas passage holes in each of said gas diffusing plates.

11. The plasma CVD apparatus according to claim 8, wherein positions of said neutral gas passage holes in

said gas diffusing plate nearer to said lower electrode plate are different from positions of said 5 neutral gas passage holes in said gas diffusing plate nearer to said upper electrode plate.

12. The plasma CVD apparatus according to claim 11, wherein a region of said neutral gas passage holes in said gas diffusing plate nearer to said lower electrode plate is arranged in an outside region of a 5 region of said neutral gas passage holes in said gas diffusing plate nearer to said upper electrode plate.

13. The plasma CVD apparatus according to claim 8, wherein said gas introduction pipes extend from a lateral direction of said plasma confining electrode to be coupled to side portions of said plasma 5 confining electrode.

14. The plasma CVD apparatus according to claim 8, wherein said gas introduction pipes extend to pass through a peripheral portion of said plasma generation region to be coupled to upper portions of said plasma 5 confining electrode.

15. A plasma CVD apparatus comprising:
first and second electrodes;
neutral gas introduction pipes;

5 a plasma confining electrode interposed
between said first and second electrodes to separate a
plasma generation region; and

a gas supply section interposed between said
plasma confining electrode and said second electrode
to supply said neutral gas,

10 wherein said gas supply section has a hollow
structure defined by an upper plate and a lower plate,
and has gas diffusing plates provided in the hollow
structure, and has radical passage holes,

said gas supply section is connected to said
15 neutral gas introduction pipes, and a plurality of
neutral gas passage holes are provided for each of
said lower plate and said gas diffusing plates to
supply said neutral gas into said substrate processing
region, and

20 a total opening area of said plurality of
neutral gas passage holes in said gas diffusing plate
on a side of said upper plate of said gas supply
section is smaller than that of said plurality of
neutral gas passage holes in said gas diffusing plate
25 on a side of said lower plate of said gas supply
section.

16. The plasma CVD apparatus according to claim
15, wherein the number of said neutral gas passage
holes in said gas diffusing plate on the side of said

lower said gas supply section plate is more than the
5 number of said neutral gas passage holes in said gas
diffusing plate on the side of said upper said gas
supply section plate.

17. The plasma CVD apparatus according to claim
15, wherein first ones of said plurality of neutral
gas passage holes in each of said gas diffusing plates
are different in diameter from second ones of said
5 plurality of neutral gas passage holes in each of said
gas diffusing plates.

18. The plasma CVD apparatus according to claim
15, wherein positions of said neutral gas passage
holes in said gas diffusing plate nearer to said lower
said gas supply section plate are different from
5 positions of said neutral gas passage holes in said
gas diffusing plate nearer to said upper said gas
supply section plate.

19. The plasma CVD apparatus according to claim
18, wherein a region of said neutral gas passage holes
in said gas diffusing plate nearer to said lower said
gas supply section plate is arranged in an outside
5 region of a region of said neutral gas passage holes
in said gas diffusing plate nearer to said upper said
gas supply section plate.

20. The plasma CVD apparatus according to claim 15, wherein said gas introduction pipes extend from a lateral direction of said gas supply section to be coupled to side portions of said gas supply section.

21. A plasma CVD apparatus comprising:

first and second electrodes;

neutral gas introduction pipes;

a plasma confining electrode interposed

5 between said first and second electrodes to separate a plasma generation region; and

a gas supply section interposed between said plasma confining electrode and said second electrode to supply said neutral gas,

10 wherein said gas supply section has a hollow structure defined by an upper plate and a lower plate, and has gas diffusing plates provided in the hollow structure, and has radical passage holes,

said gas supply section is connected to said

15 neutral gas introduction pipes, and a plurality of neutral gas passage holes are provided for each of said lower plate and said gas diffusing plates to supply said neutral gas into said substrate processing region, and

20 a distribution density of opening area consisting of said plurality of neutral gas passage holes is higher in a central portion of each of said

gas diffusing plates than in a peripheral portion thereof.

22. The plasma CVD apparatus according to claim 21, wherein the number of said neutral gas passage holes in said gas diffusing plate on the side of said lower gas supply section plate is more than the number 5 of said neutral gas passage holes in said gas diffusing plate on the side of said upper gas supply section plate.

23. The plasma CVD apparatus according to claim 21, wherein first ones of said plurality of neutral gas passage holes in each of said gas diffusing plates are different in diameter from second ones of said 5 plurality of neutral gas passage holes in each of said gas diffusing plates.

24. The plasma CVD apparatus according to claim 21, wherein positions of said neutral gas passage holes in said gas diffusing plate nearer to said lower gas supply section plate are different from positions 5 of said neutral gas passage holes in said gas diffusing plate nearer to said upper gas supply section plate.

25. The plasma CVD apparatus according to claim

24, wherein a region of said neutral gas passage holes in said gas diffusing plate nearer to said lower gas supply section plate is arranged in an outside region 5 of a region of said neutral gas passage holes in said gas diffusing plate nearer to said upper gas supply section plate.

26. The plasma CVD apparatus according to claim 25, wherein said gas introduction pipes extend from a lateral direction of said gas supply section to be coupled to side portions of said gas supply section.